RCL Semiconductors Ltd.

3.5 Digit Count Down/Up Timer and Watch C6003

GENERAL DESCRIPTION

C6003 is a 3.5 digits count-down/up timer with watch CMOS LSI circuit. It can directly drive a 3.5 digits biplexed LCD and alarm piezoelectric buzzer. The maximum count-down time is 20 hours and count-up cycle time is 20 hours, but LCD normally displays a maximum period of count-up time 19 minuets and 59 seconds.

C6003 can be widely applied as a parking timer, an alarm timer, a pill box timer, a kitchen timer, a sports timer, etc.

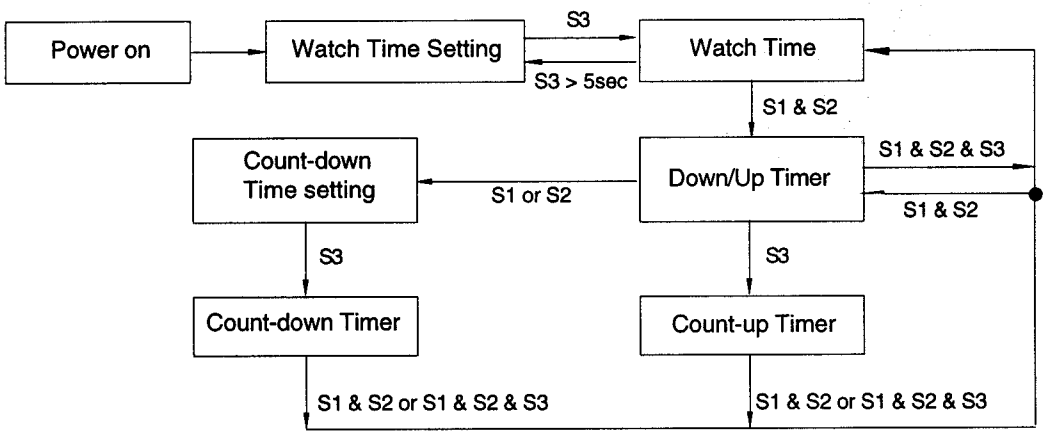
FUNCTION

- 3.5 digits LCD display count-down/up timer with watch function.
- Watch time display in count-down/up timer mode.
- Maximum count-down time 20 hours with the accuracy of 1 second.
- 5 minutes /10 minutes pre-alarm before count-down to zero.
- Buzzer output and DC output. "BUSY" output keeps high during timer counting.
- Auto recycle or manual re-set the count-down timer by "OP" option. When "OP" floated, it will auto recycle; when "OP" connected to Vdd, it will have to be manual re-set.
- Hours and minutes set independently
- Fast setting hour or minute by depressing key S1 or S2 continuously for 2 seconds
- 20 minutes count-up cycle time with maximum count-up time 20 hours
- Timer reset when two keys S1 & S2 depressed simultaneously

FEATURES

- Single 1.5V battery operation
- 32768Hz quartz crystal oscillator
- 3.5 digits LCD display
- An internal voltage doubler
- LCD test and alarm sound test
- Fast testing mode for production
- CMOS structure and low power consumption

OPERATION SEQUENCE



Notes:
1. S1 for Hour and S2 for Minute setting.
2. S3 to Start/Stop the timer.
3. S3 > 5 seconds into the watch time setting mode.
4. S1 & S2 to reset the timer to the initial state (0:00).
5. S1 & S2 & S3 to return to the watch mode.

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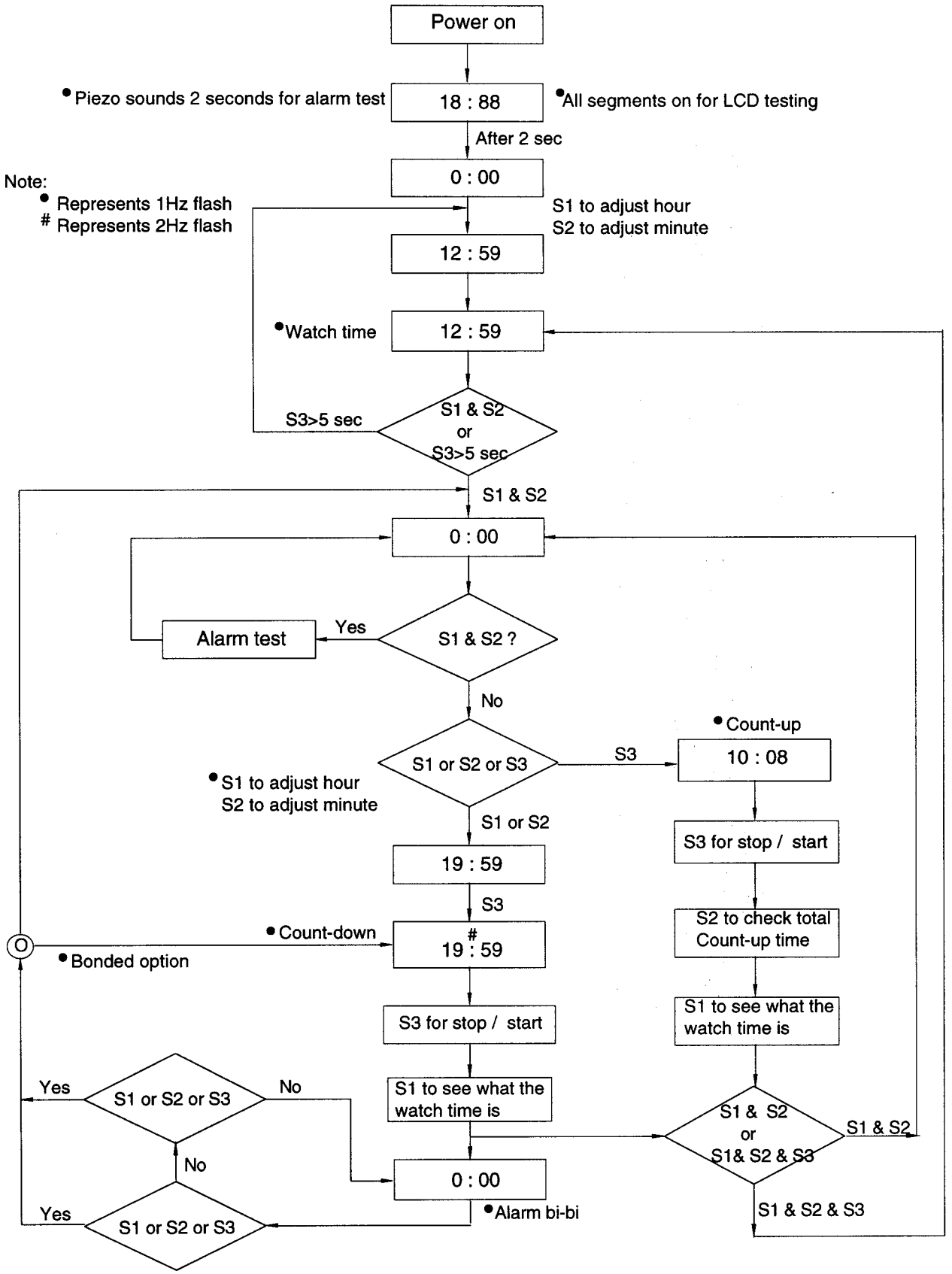
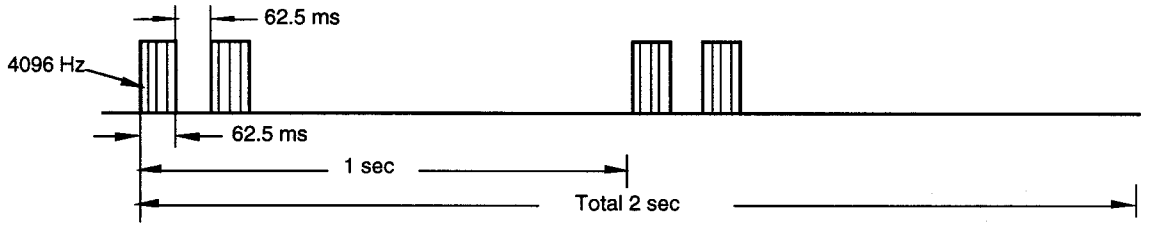
OPERATIONAL FLOW CHART

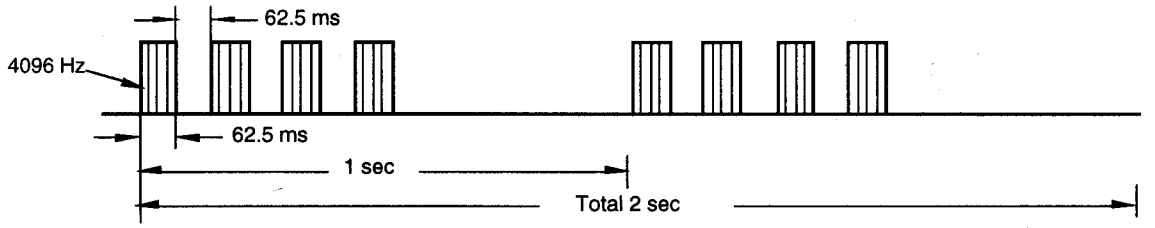


OUTPUT WAVEFORM

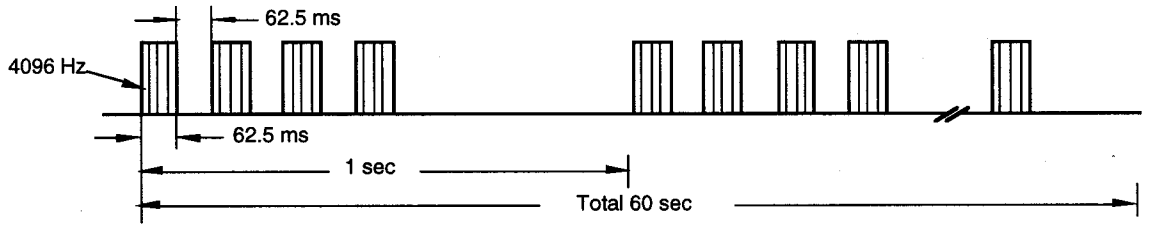
10 minutes before count-down time is over



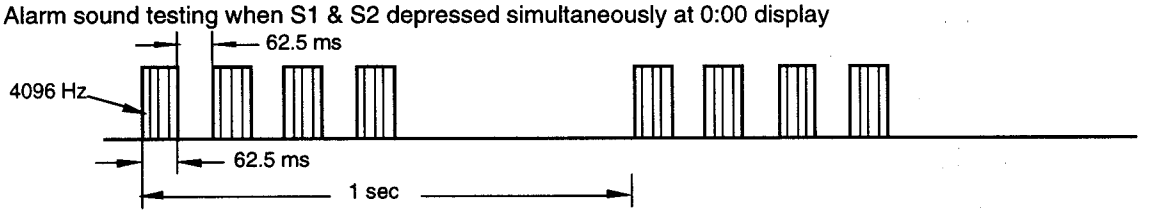
5 minutes before count-down time is over



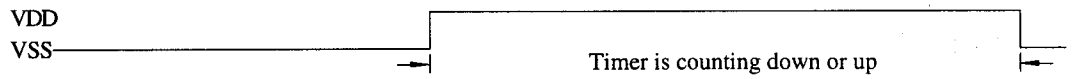
Count-down time is over



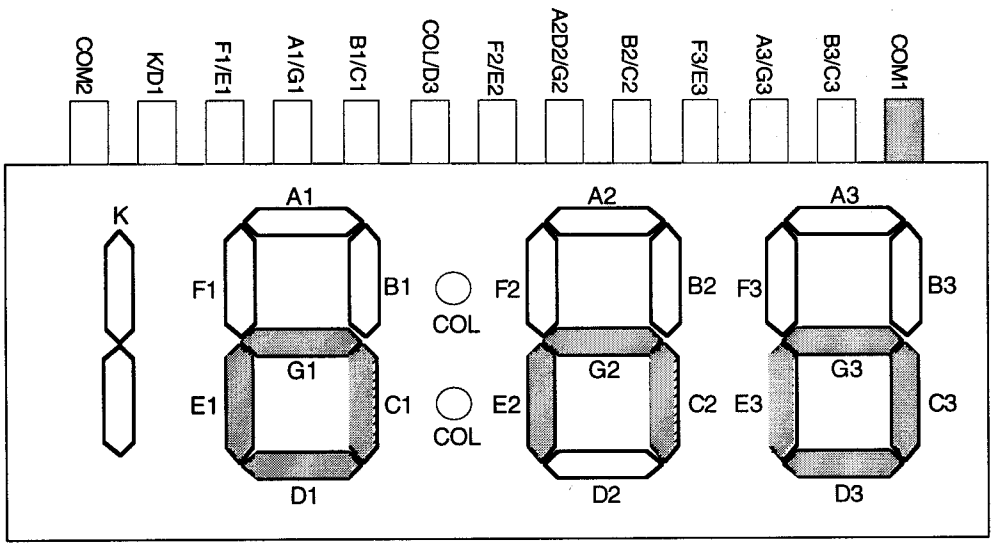
Alarm sound testing when S1 & S2 depressed simultaneously at 0:00 display



Timer busy flag output



LCD FORMAT



PAD DESCRIPTION

Pad No.	Pad Name	I/O	Description
1	S3	I	Input to start/stop the timer
2	S2	I	Input for minute setting
3	S1	I	Input for hour setting
4	VEE	-	Negative voltage supply for LCD display
5	CAP2	O	For voltage doubling capacitor
6	CAP1	O	For voltage doubling capacitor
7	COM1	O	Common 1 drive
8	BC3	O	Segment drive
9	AG3	O	Segment drive
10	FE3	O	Segment drive
11	BC2	O	Segment drive
12	ADG2	O	Segment drive
13	FE2	O	Segment drive
14	COD3	O	Segment drive
15	BC1	O	Segment drive
16	AG1	O	Segment drive
17	FE1	O	Segment drive
18	KD1	O	Segment drive
19	COM2	O	Common 2 drive
20	OSC1	I	Oscillator input
21	OSC2	O	Oscillator output
22	BUSY	O	Timer busy flag, active high
23	T2	I/O	Chip test pin
24	T1	I/O	Fast-test control pin
25	VSS	-	Negative power supply
26	VDD	-	Positive power supply
27	OP	I	Option pin for countdown recycle
28	BZ	O	Buzzer drive
29	BZB	O	Buzzer drive

TESTING MODE FOR PRODUCTION

LCD and Alarm Sound Testing:

When power is turned on, all the LCD segments are illuminated to display "18:88" and the alarm sounds for 2 seconds.

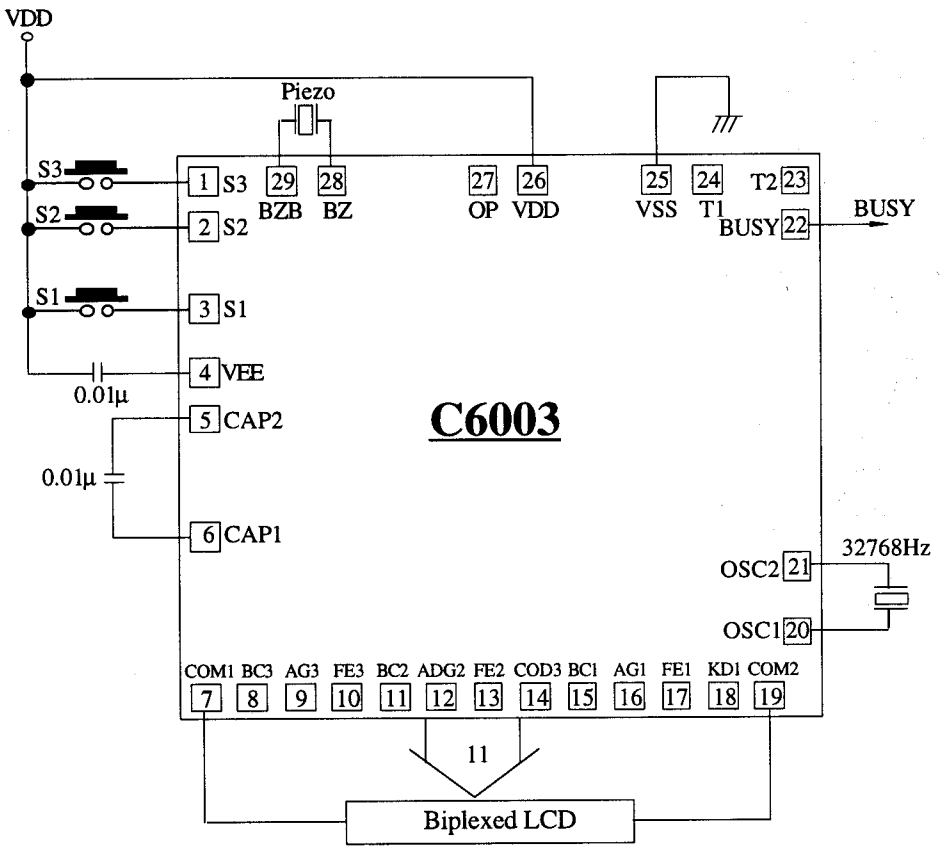
In addition, in count-down/up timer mode, depressing S1 & S2 simultaneously resets timer to the initial state (LCD displaying 0:00). In this case, the alarm sound also can be tested by depressing S1 & S2 at the same time. The alarm sound with the waveform shown in the diagram "OUTPUT WAVEFORM" wouldn't stop until S1 or S2 key is released.

DC ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta = 25°C, V_{DD} = 1.5V, V_{SS} = 0V, Fosc = 32768Hz)

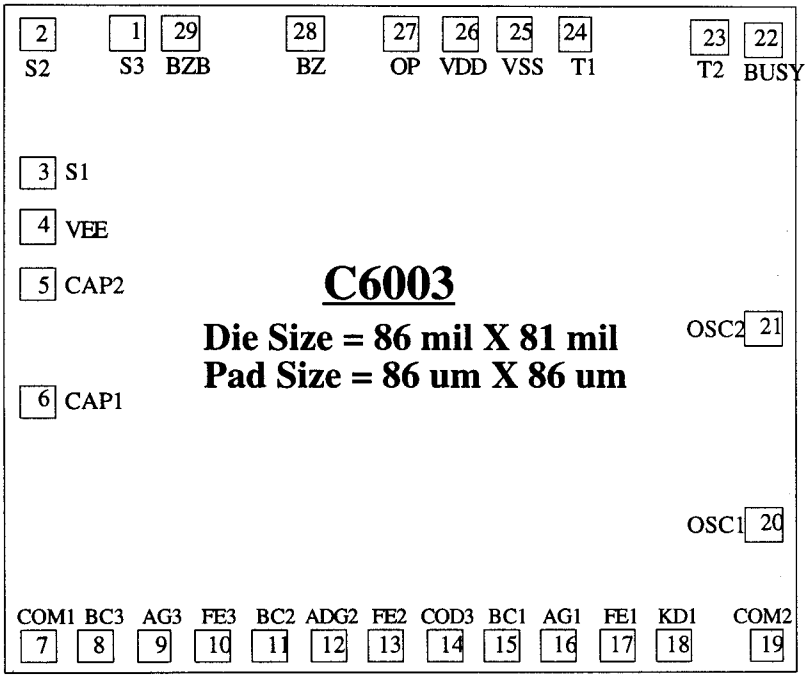
Characteristics	Symbol	Min.	Typ.	Max.	Unit	Test Condition	
						V_{DD}	Condition
Supply Voltage	V_{DD}	1.25	1.5	1.7	V	1.5V	-
Display Voltage	V_{EE}	-1.2	-1.5	-1.7	V	1.25~1.7V	-
Osc Starting Voltage	V_{STR}	1.35	-	-	V	-	Within 3 secs
Alarm Output Drive Current	I_{OHA}	-500	-	-	µA	1.5V	V_{OH} = 1.35V
Alarm Output Frequency	F_{OUT}	-	4096	-	Hz	1.5V	-
Busy Flag Output Drive Current	I_{OHF}	-500	-	-	µA	1.5V	V_{OH} = 1.35V

APPLICATION CIRCUIT



NOTE: Substrate should be connected to VDD.

PAD DIAGRAM



The Co-ordinate for Low Left Corner of Each Pad

COM1	(-978.3, -938.6)	OSC1	(917.7, -623.6)	VEE	(-1003.7, 356.5)
BC3	(-837.3, -938.6)	OSC2	(917.7, -84.0)	CAP2	(-1003.7, 214.7)
AG3	(-686.6, -938.6)	BUZY	(917.7, 852.5)	CAP1	(-1003.7, -118.3)
FE3	(-536.1, -938.6)	T2	(763.7, 852.5)		
BC2	(-385.4, -938.6)	T1	(464.9, 852.5)		
ADG2	(-234.9, -938.6)	VSS	(316.3, 852.5)		
FE2	(-84.2, -938.6)	VDD	(150.0, 852.5)		
COD3	(66.3, -938.6)	OP	(-1.1, 852.5)		
BC1	(217.0, -938.6)	BZ	(-254.5, 852.5)		
AG1	(367.5, -938.6)	BZB	(-613.3, 852.5)		
FE1	(518.2, -938.6)	S3	(-764.6, 852.5)		
KD1	(668.7, -938.6)	S2	(-1003.7, 852.5)		
COM2	(917.7, -938.6)	S1	(-1003.7, 508.0)		